IEEE P802.11
Wireless LANs

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| Comment Resolution for Subclause 9.41.5 |
| Date: 2013-12-11 |
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Abstract

This submission proposes resolutions for comments in clause 9.41.5 of TGah Draft 1.0 with the following CIDs:

1234, 1235, 1236, 1514, 1515, 1650, 1651, 1875, 1876, 1877, 1878, 1880, 1881, 1882, 1883, 2145, 2146, 2221, 2226, 2227, 2228, 2753

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGah Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGah Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGah Editor: Editing instructions preceded by “TGah Editor” are instructions to the TGah editor to modify existing material in the TGah draft. As a result of adopting the changes, the TGah editor will execute the instructions rather than copy them to the TGah Draft.***

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| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Clause Num** | **P** | **L** | **Comment** | **Propose Change** | **Resolution** |
| 1234 | 9.41.5 | 184 | 18 | "to setup scheduled" -- "setup" is not a verb | "to set up scheduled" | Agree with the commenterRevised:TGah editor to make changes shown in 11-13-1515r2 |
| 1235 | 9.41.5 | 184 | 22 | "element with NDP Paging field present" - missing article | "element with the NDP Paging field present" | Agree with the commenterRevised:TGah editor to make changes shown in 11-13-1515r2 |
| 1236 | 9.41.5 | 184 | 23 | "NDP Paging Request"Initial caps are reserved for proper names of frames, fields, elements ..., not concepts. | Change to "NDP paging request". Ditto "NDP paging response". Ditto "NDP paging responder". | NDP Paging, NDP Paging Request and NDP Paging Response are names of the framesI agree with “NDP Paging responder” and “NDP Paging requester”Revised:TGah editor to make changes shown in 11-13-1515r2 |
| 1514 | 9.41.5 | 185 | 1 | The NDP Paging awake duraiton is not clear | clarify the awake duration for NDP Paging | The following is added to make it clear: NDP Paging STA shall stay awake until it receives a frame from the peer STA with EOSP equal to 1.Revised:TGah editor to make changes shown in 11-13-1515r2 |
| 1515 | 9.41.5 | 185 | 185 | The NDP Paging STA may be operating in a predefeined scheduled way (TWT or RAW), its wake up should be supported to happen in the scheduled way | Add a new Action to wakeup in the next TWT or RAW | A new Action is added to wake up in the predefined time.Revised:TGah editor to make changes shown in 11-13-1515r2  |
| 1650 | 9.41.5 | 185 | 20 | "ofin" is not a word. | Replace "ofin" with "in". | Agree with the commenterRevised:TGah editor to make changes shown in 11-13-1515r2 |
| 1651 | 9.41.5 | 185 | 32 | "ofin" is not a word. | Replace "ofin" with "in". | Agree with the commenterRevised:TGah editor to make changes shown in 11-13-1515r2 |
| 1875 | 9.41.5 | 206 | 28 | "A STA can request an NDP Paging TWT by sending an NDP Paging Request as described in this clause." Is there any other way? The use of 'can' indicates that there is? Also why state "in this clause"? | Replace "A STA can request an NDP Paging TWT by sending an NDP Paging Request as described in this clause." With "A STA requests an NDP Paging TWT by sending an NDP Paging Request." | Agree with the commenterRevised:TGah editor to make changes shown in 11-13-1515r2 |
| 1876 | 9.41.5 | 206 | 34 | "A non-AP STA sending an NDP Paging Request to a NDP Paging Responder STA," Until the STA sends the response it is not a 'Responder? | Replace "A non-AP STA sending an NDP Paging Request to a NDP Paging Responder STA" with "A non-AP STA sending an NDP Paging Request to a STA," | Agree with the concept.RevisedTGah editor to make changes shown in 11-13-1515r2 |
| 1877 | 9.41.5 | 206 | 37 | "An AP sending an NDP Paging Request to a NDP Paging Responder ," Until it sends a response it is not a 'Responder? | Replace "An AP sending an NDP Paging Request to a NDP Paging Responder " with "An AP sending an NDP Paging Request," | Agree with the concept.RevisedTGah editor to make changes shown in 11-13-1515r2 |
| 1878 | 9.41.5 | 206 | 42 | "with an NDP Paging Field defined as follows:" 'defined' is the wrong word. The list that follows are the settings that shall be set. Reword. | Replace "with an NDP Paging Field defined as follows:" With "with the NDP Paging field settings as follows:" | Agree with the commenterRevised:TGah editor to make changes shown in 11-13-1515r2 |
| 1880 | 9.41.5 | 207 | 20 | "ofin" should be 'of" | Replace "ofin' with "of" | Agree with the commenterRevised:TGah editor to make changes shown in 11-13-1515r2 |
| 1881 | 9.41.5 | 207 | 32 | "ofin" should be 'of" | Replace "ofin' with "of" | Agree with the commenterRevised:TGah editor to make changes shown in 11-13-1515r2 |
| 1882 | 9.41.5 | 207 | 40 | "in which the STA shall be in Active mode." Should be 'in which case the' | Replace with "in which case the STA shall be in Active mode." | Agree with the commenterRevised:TGah editor to make changes shown in 11-13-1515r2 |
| 1883 | 9.41.5 | 207 | 45 | "If the Action subfield of the NDP Paging Response is 0: If the NDP Paging Requester STA is a non- AP STA, it shall send a (NDP) PS-Poll or uplink trigger frame addressed to the NDP Paging Responder. If the NDP Paging Requester STA is an AP, it shall send an NDP CTS to self with the duration field set to zero." Wrong use of colon and capitals etc. If using bullets then stick to them. | Add indented bullets at "If the NDP Paging Requestor is a non-AP STA" and " If the NDP Paging Requestor is a n AP" | Agree with the commenterRevised:TGah editor to make changes shown in 11-13-1515r2 |
| 2145 | 9.41.5 NDP Paging Setup | 184 | 51 | change "the TWT Command Reply field of NDP Paging Response TWT element" to " the TWT Command Reply field in TWT element of NDP Paging Response " | change "the TWT Command Reply field of NDP Paging Response TWT element" to " the TWT Command Reply field in TWT element of NDP Paging Response " | Agree with the commenterRevised:TGah editor to make changes shown in 11-13-1515r2 |
| 2146 | 9.41.5 NDP Paging Setup | 101 | 30 | There's no Minimum Sleep Duration field | Change to "Min Sleep Duration field" | Agree with the commenterRevised:TGah editor to make changes shown in 11-13-1515r2 |
| 2221 | 9.41.5 | 184 | 22 | Have some questions to the text in line 22 page 184, including: there is no indication info in the NDP Paging field as defined in Figure 8-401de. Then, how to indicate a NDP request or a NDP response? Does it use the TWT Request indicator? If so, then can a STA request a TWT and NDP paging at the same time? | Please clarify the text in line 22 page 184 to address the questions asked by the comment. | Reject:Comment fails to identify an issue.In response to the commenter:NDP Paging field is in TWT element (Figure 8-401da).Yes, it should use TWT element as described in the paragraph |
| 2226 | 9.41.5 | 185 | 27 | There are multiple issues with the way in which the Check Beacon field is used:1) it cannot correctly indicate the need of "Check Beacon" by flipping an 1-bit "Check Beacon" field when there are more one critical Beacon updates during a TWT interval, e.g., a long TWT interval, e.g., in hours or days;2) It requires the STA to remember the most recent "Check Beacon" value, which is very problematic for STAs that may be not always assoicated with the same BSS.Suggest changing the 1-bit "Check Beacon" indicator to indicate "check Beacon" by setting to 1; othersise setting to 0. | Make the following changes:1┤+δChange the paragraph in line 27 page 185 to the following:The Check Beacon field is set to 1 to indicate there has been a critical update to the Beacon frame since the most recent NDP Paging frame sent to the Paing Rquester STA.2┤+δ change the paragraph in line 1 page 186 to the following:A non-AP STA which has setup NDP Paging shall wake at the next TSBTT to attempt to receive the nextexpected Beacon or Short Beacon frame if it receives an NDP Paging frame with Direction field set to 1 andthe Check Beacon field set to 1. | Reject:The comment fails to identify a real issue.In response to the commenter:The NDP Paging feature is most useful to be used in a more frequent wakeups scenario.The check beacon should not happen that frequently and if it is needed for the STA to be aware of it, it should schedule the NDP Paging TWTs more frequentlyThere are more issues with the proposed resolution:In order to the proposal to work, the bit should be set only in one NDP Paging TWT (if it sets to the following intervals, it is missleading and is not clear for how many). And if the STA misses the paging message on that interval for some reason (e.g. collision), it will miss the message, while in the current proposal there is a recovery mechanism. |
| 2227 | 9.41.5 | 185 | 36 | The sentence in line 36 to 40 page 185 seems incorrect, as it says the condition given in "unless ..." is only one possible case for the STA to stay awake after receiving a NDP paging frame. Please note that there other three Actions defined in Table 8-191c--Action field also require the STA to stay awake, or at least when Action =0 as described in line 45 to 49 on page 185. | Change the sentence in line 36 to 40 on page 185 to the following:If an NDP Paging frame is received, the TWT requester STA may transition to Doze state immediately after receiving the NDP Paging frame, if Min Sleep Duration was set to non-zero and Action field set to 1 in the NDP Paging Response frame that successfully completed the NDP Paging setup. | Reject:Comment fails to identify a real issue.In response to the commenter:The only case that the STA should not go to sleep is if the “Min Sleep Duration” is set to zero. In all other cases, STA may go to sleep and wakeup again to perform the other tasks |
| 2228 | 9.41.5 | 185 | 50 | Don't understand the usefulness of the Min Sleep Duration feature: why do we ask a STW to wake up at TWT time and then tell him to go sleep immediately for a Min duration? why not just tell him to wake up at TWT time + the Min Sleep duration? In addition, the Min Sleep duration is a fairly small time, i.e., 0 to 63\*SIFS, i.e., about 630us.Also, based on the description given in line 50 to 53 on page 185, the Paging Request STA is awake when receiving Paging frame; then sleep for the Min Sleep duration in the range 0 to 630us; and then awake again. Why do we ask the STA to do such swing back and forth? Note that 630us may just be enough for one frame transmission. | Please clarify the text to adjustify the need of the Min Sleep Duration thing, or just delete it. | Reject:The comment fails to identify a real issue.In response to the commenter:The “Min Sleep Duration” will allow some of the STAs to performe in the “extreme power save” by allowing the STA to transit from “optimized receiver” to decode the Paging message only to “full receiver” to decode everything.SIFS is 160us in TGah. So the duration can go up to 10ms. |
| 2753 | 9.41.5 | 184 | 16 | What is TWT requester STA? Please keep the consistency with the term of TWT requesting STA. | Change the phrase to keep consistency for the whole subclause | Reject:The TWT requester is properly defined in the text.  |

**Discussion:**

CID 1515 – Resolution includes to add a new Action for NDP Paging so the transmitter can schedule BU transmissions after waking up the STAs.

The difference between the existing behaviour for Action 1 and the added behavior for the new Action 4 is as follows:

* If the Action subfield of the NDP Paging Response is 1, the wakeup time of the NDP Paging requester STA is determined by a NDP Paging requester STA (to satisfy any constraint from the receiver side), that is the Min Sleep Duration asked by a NDP Paging Requester.
* If the Action subfield of the NDP Paging Response is 4, the wakeup time of the NDP Paging requester STA is determined by a NDP Paging responder (to schedule the downlink BUs), that is the APDI field of the NDP Paging frame (asked by a NDP Paging responder) plus the Min Sleep Duration asked by a NDP Paging requester (to satisfy any constraint from the receiver side),.

**Instructions to TGah Editor*:***  to make the changes in subclause 9.41.5 as follows

* NDP Paging Setup

This section defines a protocol for power saving at a STA by using the TWT protocol to set up scheduled wakeup intervals and by defining an efficient signalling for the presence of BUs and synchronization.

For the purpose of this clause, a frame including a TWT element with the NDP Paging field present is referred to as NDP Paging Request or NDP Paging Response as clarified later. A STA sending an NDP Paging Request is referred to as NDP Paging requester. A STA sending a NDP Paging Response in a response to an NDP Paging Request is referred to as NDP Paging responder.

 A STA requests an NDP Paging TWT by sending an NDP Paging Request.The setup procedure follows the protocol described in 9.41.1 (TWT overview), unless otherwise described in this subclause.

A non-AP STA sending an NDP Paging Request to another STA, shall set the P-ID field of the NDP Paging Request to one of the partial AIDs assigned to the receiving STA(see 9.17b).

An AP sending an NDP Paging Request to a non-AP STA should set the P-ID field of the NDP Paging Request to the Partial BSSID.

Upon receiving an NDP Paging Request, the recipient STA shall respond with an NDP Paging Response with the NDP Paging fields set as follows:

* The P-ID field should be set to the same value as the P-ID field in the NDP Paging Request.
* The Max NDP Paging period field shall be set to any value that is less than or equal to the Max NDP Paging period in the NDP Paging Request.
* The Action field shall be set to one of the values in Table 8-191c (Action field).
* The Partial TSF Offset field and Min Sleep Duration field are reserved.

The NDP Paging setup is successful if the TWT Command Reply field of the NDP Paging field in the NDP Paging Response is set to 4 (Accept TWT), otherwise the setup is considered as failed.

A STA which has sent an NDP Paging Response frame with the TWT Command Reply field set to 4 (Accept TWT) shall schedule an NDP Paging frame as the first frame for transmission at the TWTs indicated by the NDP Paging Response, if any of the following conditions is satisfied:

* There are BUs for the Requesting STA
* No NDP Paging frame was sent in the N consecutive preceding TWT(s), where N is equal to the value of the Max NDP Paging Period field in the NDP Paging Response.

The AP shall schedule an NDP Paging frame if there are critical updates to the (Short) Beacon as defined in clause 10.46.1 (System information update procedure) and 10.2.2.17 (TIM Broadcast). An AP may additionally send an NDP Paging frame as the first frame for transmission at any of the TWT times indicated by the NDP Paging Response.

If any frame is sent by the AP to an NDP Paging requester during its indicated TWT duration then the first frame sent shall be an NDP Paging frame with Direction field set to 1.

If any frame is sent by a non-AP STA to an NDP Paging requesters during its indicated TWT duration then the first frame sent shall be an NDP Paging frame with Direction field set to 0.

The P-ID field of the NDP Paging frame shall be set to the same value as P-ID field in the NDP Paging Response if and only if there are BUs for the STA identified by the Partial AID indicated in the P-ID field of the NDP Paging Request. The value of the P-ID field shall be set to 0 to indicate the presence of group addressed BUs.

If the Direction field of the NDP Paging frame is set to 1, the APDI field of the NDP Paging frame shall be set as follows:

* The PTSF field is set to TSF[Partial TSF Offset+4: Partial TSF Offset+11] (inclusive), where TSF is the 8 bytes value of the TSF and Partial TSF Offset is the value of the Partial TSF Offset field in the NDP Paging Request.
* The Check Beacon field is initialized to 0 and incremented after each critical update to the Beacon frame; the value of the Check Beacon field shall be same as the LSB of the Check Beacon field in the most recent TIM Broadcast frame, if any was sent before the NDP Paging frame.

If the Direction field of the NDP Paging frame is set to 0, the PAID field of NDP Paging frame indicates the Partial AID of the STA transmitting the NDP Paging frame.

If no NDP Paging frame is received during the TWT, the TWT requester STA may transition to Doze state at the end of the Minimum Awake Duration for the TWT. If an NDP Paging frame is received, the TWT requester STA may transition to Doze state immediately after receiving the NDP Paging frame, unless Min Sleep Duration was set to 0 and Action field set to 1 in the NDP Paging Response frame that successfully completed the NDP Paging setup, in which case the STA shall be in Active mode.

Upon reception of a NDP Paging frame with the P-ID field matching the value of the P-ID field in the NDP Paging Response, the NDP Paging requester STA shall behave as follows:

* If the Action subfield of the NDP Paging Response is 0:
* If the NDP Paging requester STA is a non-AP STA, it shall send a (NDP) PS-Poll or uplink trigger frame addressed to the NDP Paging responder.
* If the NDP Paging requester STA is an AP, it shall send an NDP CTS to self with the duration field set to zero.
* If the Action subfield of the NDP Paging Response is 1, the STA shall be in the Awake state starting at a time indicated by the Min Sleep Duration field after the end of reception of the NDP Paging frame, and it shall remain in the Awake state until a frame is received from the NDP Paging responder with the EOSP subfield equal to 1.
* If the Action subfield of the NDP Paging Response is 2, the STA shall be in the Awake state at the first TBTT that occurs after a time indicated by the Min Sleep Duration field in the NDP Paging Response after the end of reception of the NDP Paging frame to receive the (Short) Beacon.
* If the Action subfield of the NDP Paging Response is 3, the STA shall be in the Awake state at the first DTIM that happens after a time indicated by the Min Sleep Duration field in the NDP Paging Response after the end of reception of the NDP Paging frame to receive the DTIM Beacon.
* If the Action subfield of the NDP Paging Response is 4, the STA shall be in the Awake state starting at a time T after the end of reception of the NDP Paging frame and and it shall remain in the Awake state until a frame is received from the NDP Paging responder with the EOSP subfield equal to 1. The value of T is equal to the value of the Min Sleep Duration field of the NDP Paging Request plus the value indicated by the 8 MSB of APDI field of the NDP Paging frame.

If the NDP Paging requester is an AP, values 2-7 (inclusive) of the Action subfield are reserved.

A non-AP STA which has setup NDP Paging shall wake at the next TSBTT to attempt to receive the next expected Beacon or Short Beacon frame if it receives an NDP Paging frame with Direction field set to 1 and the Check Beacon field value different from the most recently received value.

**Instructions to TGah Editor*:***  to make the changes in subclause 8.3.5.1.7 as follows

* NDP Paging

The NDP MAC frame body of NDP Paging frame contains the information shown in Table 8-53 (NDP MAC frame body of NDP Paging (1 MHz)).

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| * NDP MAC frame body of NDP Paging (1 MHz)
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| Field | Size (bits) | Description |
| NDP MACFrame Type | 3 | The NDP MAC Frame Type field is set to 6. |
| P-ID | 9 | The P-ID field is the identifier of the NDP Paging Requester, as described in 9.41.5 (NDP Paging Setup). |
| APDI/PAID | 9 | If the Direction field is set to 1, this field indicates the APDI (AP Direction Information). The 8 MSBs of the APDI are set based on thevalue of the Action subfield of the NDP Paging Response:* If the Action subfield is not equal to 1, the 8 MSBs of the APDI are setto the value of the PTSF field which stores the partial TSF of the transmitting STA as defined in 9.41.5 (NDP Paging Setup).
* If the Action field is equal to 4, the 8 MSBs of the APDI are set to the time, in units of SIFS, after which the receiver STA is in Awake state as described in 9.41.5 (NDP Paging Setup).

The LSB of the APDI is set to the Check Beacon bit that is an indicator of critical changes in the beacon as described in 9.41.5 (NDP Paging Setup).If the Direction field is set to 0, this field indicates the PAID of the NDP Paging Responder STA. |
| Direction | 1 | The Direction field is set to 1, if the NDP Paging Responder is an AP, otherwise it is set to 0. |
| Reserved | 3 | All reserved bits are set to 1.  |

The NDP MAC frame body of NDP Paging frame contains the information shown in Table 8-54 (NDP MAC frame body of NDP Paging (2 MHz))

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| * NDP MAC frame body of NDP Paging (≥2 MHz)
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| Field | Size (bits) | Description |
| NDP MACFrame Type | 3 | The NDP MAC Frame Type field is set to 6. |
| P-ID | 9 | The P-ID field is the identifier of the NDP Paging Requester, as described in 9.41.5 (NDP Paging Setup). |
| APDI/PAID | 9 | If the Direction field is set to 1, this field indicates the APDI (AP Direction Information). The 8 MSBs of the APDI are based on thevalue of the Action subfield of the NDP Paging Response:* If the Action subfield is not equal to 1, the 8 MSBs of the APDI are setto the value of the PTSF field which stores the partial TSF of the transmitting STA as defined in 9.41.5 (NDP Paging Setup).
* If the Action field is equal to 4, the 8 MSBs of the APDI are set to the time, in units of SIFS, after which the receiver STA is in Awake state as described in 9.41.5 (NDP Paging Setup).

The LSB of the APDI is set to the Check Beacon bit that is an indicator of critical changes in the beacon as described in 9.41.5 (NDP Paging Setup).If the Direction field is set to 0, this field indicates the PAID of the NDP Paging Responder STA. |
| Direction | 1 | The Direction field is set to 1, if the NDP Paging Responder is an AP, otherwise it is set to 0. |
| Reserved | 15 | All reserved bits are set to 1.  |

**Instructions to TGah Editor*:***  to make the changes in table 8-191c in the subclause 8.4.2.170j as follows

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| * Action field
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| Action  | Options |
| 0 | Send a PS-Poll or uplink trigger frame |
| 1 | Wake up at the time indicated by Min Sleep Duration |
| 2 | STA to receive the Beacon |
| 3 | STA to receive the DTIM Beacon |
| 4 | Wakeup at the time indicated by Min Sleep Duration and the 8 MSB of APDI field of the NDP Paging frame |
| 5-7 | Reserved |